fybr

People. Places. Connected.

ABOUT US
WHO WE ARE

Cities are growing by the day with more than two-thirds of the World's population expected to live in urban areas by 2050. As cities grow, the way urban infrastructure evolves has never been more critical to community development and the overall quality of life.

The Fybr Smart City Platform

can help communities operate more efficiently while reducing operating costs and improve the quality of life. Virtually limitless amounts of information can be collected in today's smart cities. Our turnkey solution collects more information – more efficiently – turning it into actionable insights that allow communities to make PROACTIVE and INFORMED decisions.

By focusing on lighting, transportation, and water/environmental monitoring, the Fybr Smart City Platform is an end-to-end IoT solution that can deliver data safely, securely, and in real-time – providing communities with the best and fastest opportunity to create a return on investment. By not only capturing infrastructure value but also maximizing that value across departments, cities can quickly build a Smart City solution that delivers optimal operational, financial and social outcomes.

ABOUT US
HISTORY

Fully designed and manufactured in the United States, Fybr has built and proven a technology foundation that reliably, efficiently, and quickly integrates physical assets into enterprise processes. We help cities and companies make customers happier, optimize operations, and make better decisions.

In multiple large-scale deployments, we have demonstrated that our tools effectively and reliably enable cities and communities to exploit opportunities created at the intersection of digital information and the physical world. Our tightly integrated system has been proven to successfully tackle the challenges these communities face while enabling a fast path to ROI for IoT projects.

The Fybr Smart City Platform has proven its ability to deliver accurate, reliable, real-time data across thousands of devices in some of the harshest urban environments like Washington D.C, San Francisco, Montreal, and Dallas; in university campuses like Texas A&M; and recently in truck rest stops along US Highways.

Additionally, San Mateo County (Silicon Valley) has chosen Fybr as the platform for their smart cities laboratory due to the extensibility of the platform – offering the ability to "future proof" IoT solutions to the greatest possible extent.

PROVEN AT SCALE

Deploying a network of tens of thousands of geographically distributed, ultra-low-power, wireless devices in a complex urban environment can present many real-world challenges, many of which we have incorporated into our current system:

- Operating in Montreal's -27°C winters, we learned how to maintain battery reliability and efficiency in extreme weather conditions.
- Operating in radio noise-prone Washington DC and electromagnetic interference-prone San Francisco, we perfected reliable, efficient, low-latency, and secure delivery of messages to and from devices in harsh, evolving urban settings.
- Rapidly iterating with our customers in these early deployments, the Fybr Platform is highly tuned for safe, reliable and power efficient over-the-air updates to firmware, configuration and algorithms operating in the low-power edge of the network.
- For high security, we've implemented best practices, secure network protocols, anomaly detection algorithms, and tightly controlled processes into our system that carefully manage the entire life cycle of devices and their keys from manufacturing to recycling and enable a reliable, encrypted—yet power efficient—network.
- Installing tens of thousands of devices while navigating city permits and permissions, our field teams have highly optimized installation, configuration, and testing processes. For example, installing Fybr's parking sensors in roadbeds takes a team of three people less than five minutes per sensor.

ABOUT US
PARTNERS

Fybr has been selected as a leading Smart City partner by a number of the top system integrators, such as Siemens, World Wide Technology, Inc., HPE and Conduent (formerly Xerox). These large organizations have evaluated our platform, sensors, engineering, and total solutions capability before teaming with us to provide holistic solutions. The consensus from each organization is that Fybr's proven track record and ability to provide the technological expertise to support smart city initiatives will prove to be critical to ensure project success – all while reducing infrastructure costs by utilizing one consistent, reliable platform across multiple verticals.

SIEMENS

Hewlett Packard Enterprise

CONDUENT

World Wide Technology

THE FYBR PLATFORM
AN END-TO-END SOLUTION

Fybr is a comprehensive, modern framework that spans from edge devices to cloud servers and enables rapid development for a variety of industrial IoT use cases.

The Fybr Platform is designed to form a tightly integrated technology that enables rapid development of custom solutions on a proven foundation to minimize time-to-market and the risks of building a piecemeal solution while maximizing return on investment and system reliability.

The foundational components of the Fybr Platform are:

Fybr Engine

An elastic cloud with a distributed stream processing core, a device data lake, a real-time asset knowledge graph and secure device life cycle management; the Fybr Engine provides highly customizable, machine learning empowered digital twins with streaming decision pipelines to help integrate physical devices into your enterprise business processes. Fybr Engine also provides RESTful and Streaming Application Programming Interfaces (APIs) along with pluggable enterprise integration modules to cut across silos and enables integration between enterprise systems and connected devices.

Fybr Network

A highly optimized, secure, and reliable physical network for low-power wireless or wired devices, the Fybr Network provides a fault-tolerant, battery efficient, low-latency, high-throughput, encrypted, bi-directional communication layer that can simultaneously host multiple IoT applications. The Fybr Network works with Fybr Engine to provide safe over-the-air upgrades, granular configuration management, security monitoring and reliable delivery of device messages.

FybrLynk™

A wireless hardware module that is compatible with thousands of existing off-the-shelf peripheral sensors, FybrLynk provides hardware-based cryptography with encrypted key storage and comes in a drop-in form factor for easy PCB design and manufacturing. FybrLynk comes ready-to-connect with the Fybr Network – providing the ability to field thousands of devices with a low-power wireless network that has been proven to be reliable and battery efficient in harsh, interference-prone city-scale deployments.

CharioT

Fybr's device operating system – CharioT – comes installed on each FybrLynk module, and has baked-in Fybr Network protocols –bringing with it the reliability, fault-tolerance, security and power efficiency of the Fybr Network. CharioT also provides a safe sandbox environment for programming edge devices with customer business logic – improving the speed of iteration and innovation of IoT solutions by significantly reducing the risk of accidentally pushing bad firmware updates that may destroy your entire network.

Fybr ToolChain

Fybr provides a comprehensive set of tools to develop, integrate and operate IoT solutions – helping businesses run better. The Fybr Toolchain includes an operations dashboard designed to help install, configure, and monitor devices; APIs and integration tools to integrate with enterprise services; visual application development tools to help program edge devices and their digital twins with business logic; and a hardware development kit to build FybrLynk-based devices.

THE FYBR PLATFORM
SECURITY

Fybr's holistic approach to security means it is the foundation of our platform and our first consideration. To securely live in public spaces, each device needs to be a trusted platform that doesn't compromise the security of the whole platform. With numerous examples of attacks on IoT platforms that use shared keys, store keys in firmware, or perform cryptography in code, we mitigate these scenarios by incorporating a secure cryptographic key storage and a secure cryptographic processor.

Our devices quarantine cryptographic functions from the microcontroller in a hardware-based AES black box – performing operations based on the keys without revealing the keys to the microcontroller.

However, processing of keys is only one part of the equation. Secure session key delivery is essential. Each of our devices contains a unique set of keys exclusively used to securely deliver session keys, which are unique per device and can be securely changed at any time.

Most importantly, by controlling the entire chain from edge device to server, our platform offers true end-to-end authenticated encryption – ensuring that any packet received anywhere within our ecosystem is known to be free from tampering.

Our gateways are simply proxies that do not possess end-device keys at any time, meaning they cannot decrypt communications originating from, or destined to, any end device – further reducing the risk of malicious attacks.

Combined, our ecosystem provides for both confidentiality and authentication of data – making it safe from replay attacks.

When needed, firmware patches are protected by independent encryption using unique keys. This guarantees that only approved and authenticated code is applied – denying an attacker a chance to inject malware.

Because we use end-to-end encryption, our gateway-specific command and control communications are protected by the same technology. Industry-standard TLS protects our gateway-to-cloud and cloud-to-application traffic.

All of the above pertains to data-in-transit. Our data-at-rest is encrypted using industry standard protocols, while denial-of-service attacks are detected and mitigated by our cloud providers.

THE FYBR PLATFORM
SINGLE PLATFORM BENEFITS

Creating a reliable, secure, and scalable network is one of the most critical first steps in developing a smart city infrastructure.

Many companies can quickly set up an IoT network, but building one that is reliable, easily scalable, can withstand the abuses of harsh outdoor environments, and provide the highest level of security is a much more difficult task.

The Fybr Smart City Platform Has You Covered

Our network has been deployed in some of the harshest environmental conditions for nearly a decade, with multiple generations of improvements over that timeframe. The result is an ultra-secure, end-to-end network that is the core of all of our IoT and Smart City initiatives.

Once Fybr's gateways are deployed in a community, we provide a network that can easily support multiple initiatives on one platform – reducing clutter, service providers, and cost. This is all achieved while guaranteeing security parity across multiple use cases.

On the following pages, we've outlined several of our purpose-built smart city devices that are currently in production and actively in use.

This means that future Smart City solutions can be deployed in weeks, rather than months or years.

INTELLIGENT LIGHTING
FYBRLYTE CONTROLLER

Converting existing light fixtures to LED is an excellent way to help the environment while reducing energy costs by 50-80%. With FybrLyte even further energy savings can be achieved while adding increased functionality to your lighting systems.

Developed as a cost-effective and sustainable means of adding smart functionality to existing infrastructure, FybrLyte is an intelligent lighting controller that quickly connects to new or existing street and roadway fixtures – allowing you to track lighting use accurately, perform preventative maintenance, and dynamically adjust lighting levels.

By creating enhanced dimming policies, lighting schedules, and traffic-based triggers, communities can further reduce energy consumption. FybrLyte also allows you to build new public safety features into your lighting platform as well. With features such as emergency response and disaster lighting schedules, existing lighting infrastructure can easily be utilized for improved safety and convenience.

The sleek, durable, and compact (3.45" w x 3.8" h) design blends seamlessly into any style of street or roadway lighting while still being capable of operating in the harshest environments.

INTELLIGENT LIGHTING
FYBRLYTE CONTROLLER

Features

A photocell in every controller
All of our controllers come equipped with built-in photo sensors – enabling operation the moment they are connected, or in the event network connectivity is unavailable. This feature also allows each controller to provide overrides to schedules during environmental events such as weather-related daylight changes.

Fault monitoring
In case of any faults, FybrLyte automatically sends failure notices, allowing for application or mobile alerts – configurable in the portal or into third-party maintenance applications through Fybr's web services APIs.

Dimming interface
Each FybrLyte controller supports 0-10v dimming. As an added feature, lights can be dynamically dimmed using external triggers/ devices, such as parking events, weather conditions, motion, and more.

Smart control
Individual and autonomous response to local ambient light, integrated or external motion sensors, environmental sensors, acoustic sensors (glass breakage or gunshots), and more.

Secure communications
Each FybrLyte controller uses NIST-approved encryption algorithms and unique keys.

Remote upgrades
Our system is designed to allow for quick and easy upgrades – wirelessly delivering patches to firmware.

Integrated accellerometer
Receive alerts if a pole is knocked down or experiences potentially damaging impacts.

Plug-and-play installation
Each FybrLyte interfaces with a standard NEMA 7 socket, allowing cities and utilities to start collecting insightful data quickly, securely, and accurately.

Real-time revenue grade power metering
Track power consumption with a highly accurate (within .5%) energy-monitoring module. By monitoring the energy consumption of each light, fixture failures can be predicted proactively to minimize maintenance time and costs, while maintaining public safety. Additionally, by more accurately measuring energy consumption, additional savings on energy can be reliably tracked and monitored.

Dynamic grouping
Group and synchronize lights by block, street, lot, or any custom configuration. Once grouped, blocks can be synchronized to ensure consistent on/off patterns and timing based on user-configurable rules.

Extra Digital & Analog Inputs
FybrLyte supports pins 6 & 7 on the ANSI C146.31 7-pin receptacle. These inputs enable the FybrLyte to interface with analog or digital sensors, such as fixture integrated motion sensors.

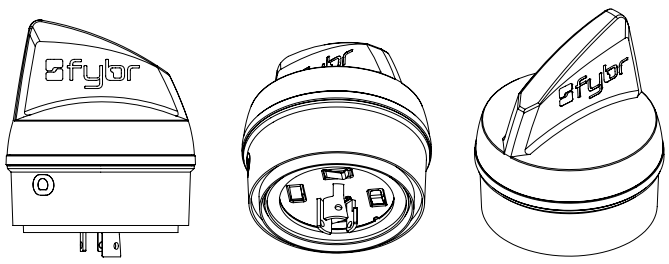
Built-in GPS
With a built-in GPS module, installation is easy. Location data is automatically loaded when installed and powered up, reducing installation and configuration times.

Functional Specifications

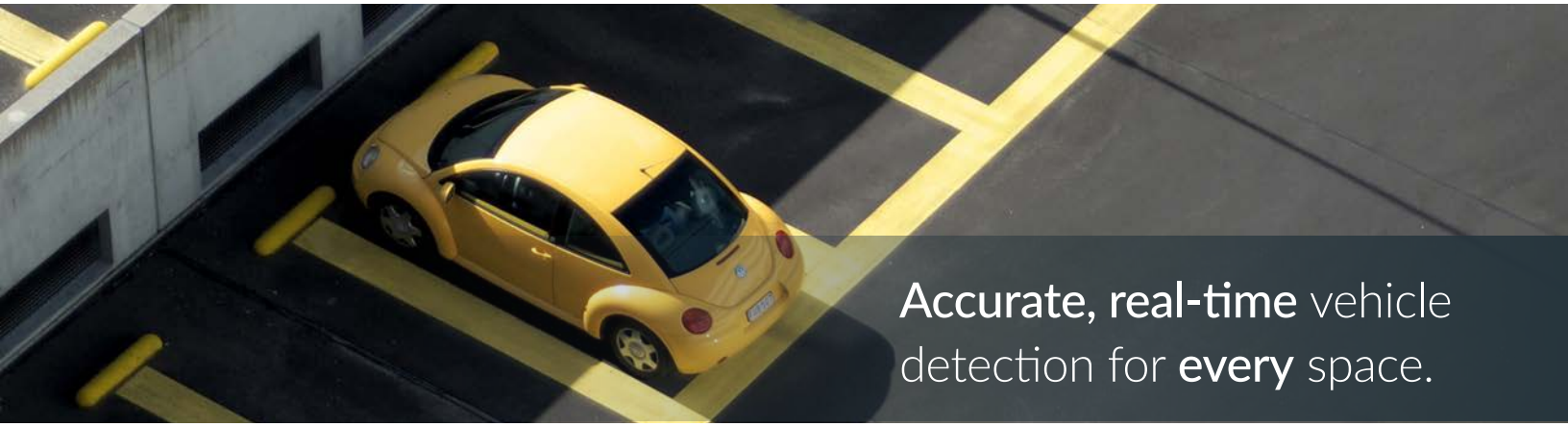
socket	standard NEMA 7
voltage	120 - 480V AC
dimming support	0 - 10V DC
modulation	LoRa™
frequency band	• 915 MHz ISM (North America) • 868 MHz ISM (EU)
RF channels	25

Physical Specifications

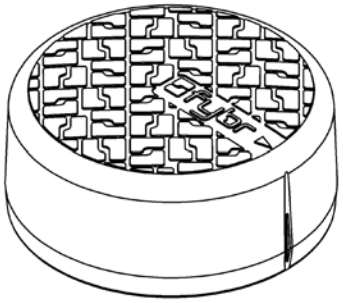
dimensions	3.45" w x 3.8" h (8.76 cm x 9.65 cm)
weight	7.2 oz
socket type	standard NEMA 7
operating temperatures	-40°C to +85°C



THE FYBR PLATFORM
INTELLIGENT PARKING



The Fybr Parking Sensor is an intelligent edge device designed for years of low-maintenance service and adaptable to a wide range of installations. In addition to a state-of-the-art MEMS magnetometer that senses vehicles, each device also has a microprocessor, a proprietary 900 MHz radio and a long-life lithium battery. These powerful components are enclosed in a durable, weatherproof plastic housing that's not much larger than a regulation hockey puck, measuring just 4-inches in diameter and 1.6-inches high.



Parking data is monitored 24/7, captured by Fybr Parking Sensors, and broadcast using a proprietary 900 MHz radio network. This communication protocol ensures reliable delivery of real-time information to our suite of mobile and desktop tools. These interactive tools serve up alerts and meaningful insights to drivers, parking managers and field technicians – improving parking oversight and experiences overall.

Features

Real-time parking data for vehicles of all shapes and sizes: 50cc-engine scooters to extended-cab trucks and everything in between.

Recessed or surface mounting enables easy, virtually invisible installation in a variety of locations: paved streets, multi-level structures and more.

Easy recessed installation in 10 minutes with no saw cuts; use a hammer or core drill to create a hole 4 in/10 cm in diameter and a max of 6.5 in/16.5 cm deep.

Automatic self-calibration adjusts each sensor to local and magnetic changes that occur over time for optimal, continuous accuracy.

Custom configuration for reliable accuracy in areas where sensing is normally challenging due to frequent trains, buried or overhead services and more.

Remote firmware upgrades executed with wirelessly delivered data patches to optimize speed and minimize use of battery power.

Failsafe data relays with message confirmation and automatic switchover to alternate gateways when needed.

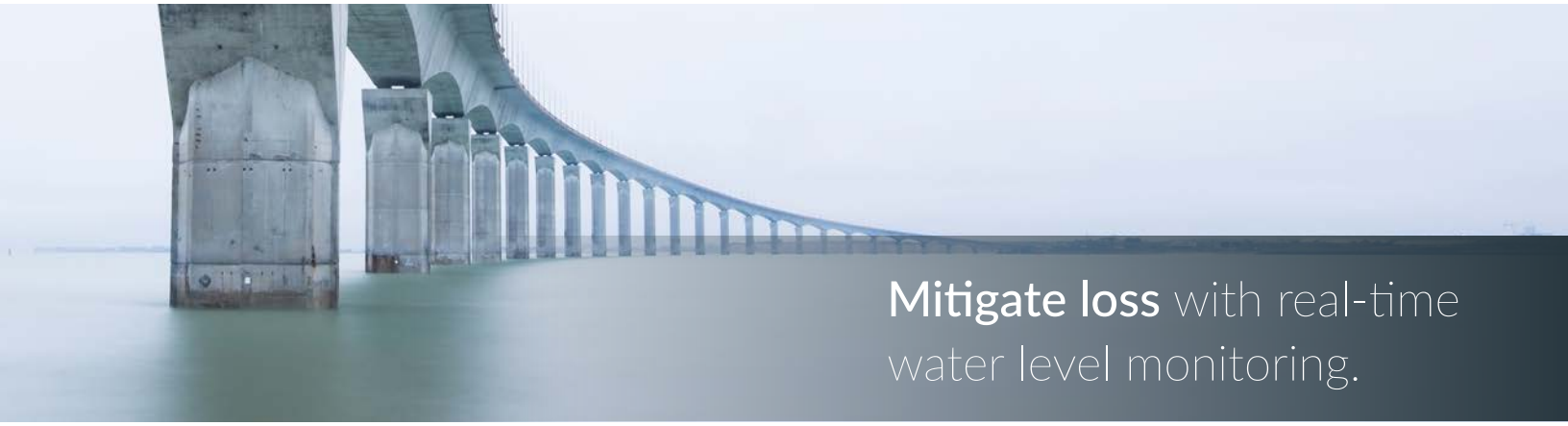
Sleep and wake modes reserve power using it only when sensing vehicles or sending/receiving network data.

Long-lasting lithium battery provides power for up to 10 years with average power use for sensing and sending/receiving data.

Compatible hardware pairs seamlessly with Fybr's end-to-end platform and can also be integrated with other systems/components.

Rugged industrial design from the inside out, with technology and housing designed for performance in extreme conditions.

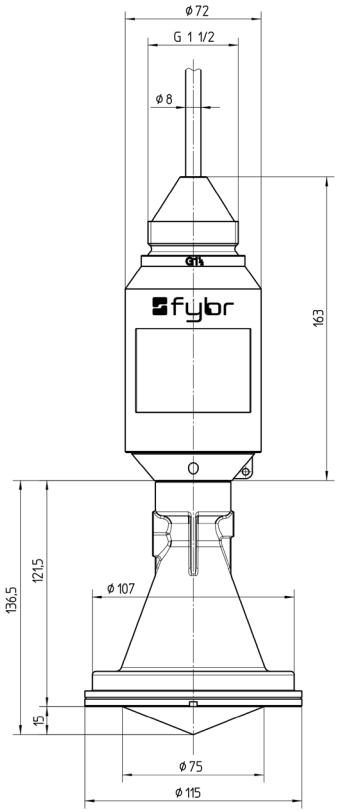
THE FYBR PLATFORM
WATER MONITORING



Water management and consumption are issues applying significant pressure to existing community infrastructure. With economic, safety, and environmental impacts on communities, managing and monitoring water supplies and excess water from environmental factors is quickly becoming a high priority.

At Fybr, our water management and smart city solutions allow communities to take proactive steps in managing flood risks while prioritizing public safety. Using our smart city platform, data collection, decision making, and control are reliable, scalable, and affordable. Our water management solution monitors changing water levels in rivers, lakes, tidal seas, storm sewers, and reservoirs. Combined with data from multiple sensor types (sewer level, soil moisture, hyper-local weather stations, and USGS and NOAA approved radar), we provide real-time, water-level data to empower communities and save lives.

Ideal for areas where submerged sensors can be damaged due to corrosion, contamination, flood-related debris, lightning, or vandalism, Fybr's water management solution is designed to be both rugged and reliable – capable of functioning in some of the harshest environments.



Features

Real-time data means low latency between measurement and reporting. To conserve energy, message timing can be configured to enable weather-dependent monitoring with more frequent readings during storm situations and less frequent readings in good weather.

Mounting with multiple power options enables easy, discreet installation in a variety of locations, with battery and solar powered options.

Automatic self-calibration adjusts each sensor to local and climate changes that occur over time for optimal, continuous accuracy.

Rugged design allows our sensors to work in some of the harshest nvironments – carrying an IP68 rating.

Remote firmware upgrades are executed with wirelessly delivered data patches for optimized speed and reliability.

FybrLynk™ – our integrated microprocessor enables all network protocol and radio communication, while allowing each device to operate autonomously and independently of the network.

Failsafe data relays with message confirmation and automatic switchover alternate between gateways when needed.

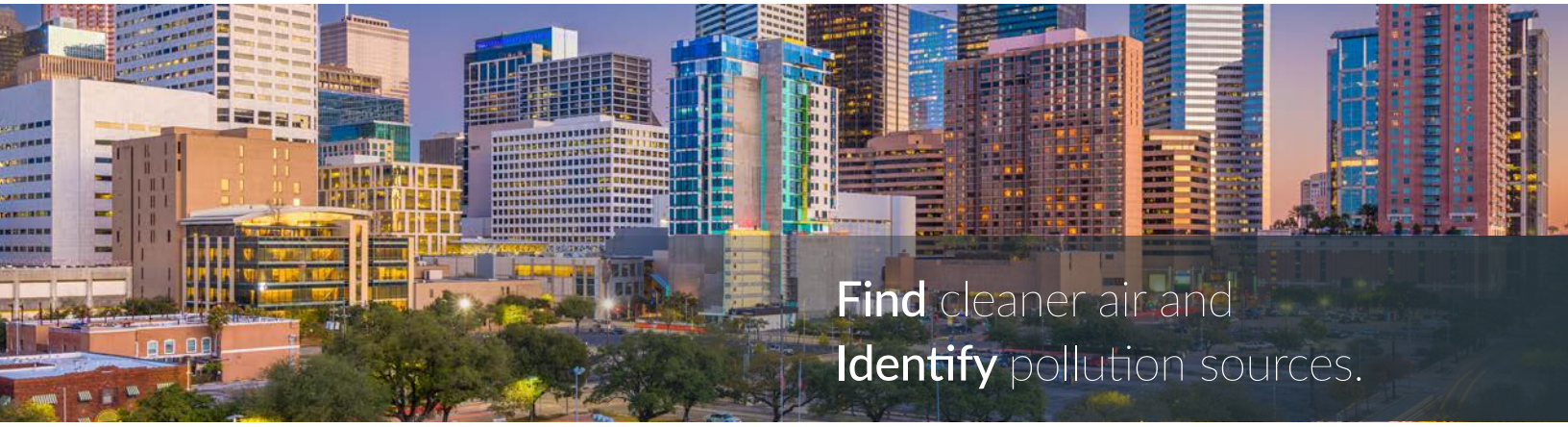
A long-life lithium battery provides power for years when using normal sensing and sending/receiving data configurations.

Enhanced security protects each individual device with NIST-approved algorithms, end-to-end encryption, and unique keys.

Meets USGS requirements for OSW (Office of Surface Water) accuracy standards to within 0.01%.

Monitors tides for NOAA physical oceanographic real-time system.

THE FYBR PLATFORM
AIR QUALITY



Air quality is a global problem. Each year, millions of people die due to air pollution worldwide, with more than half of those attributable to pollution outdoors. Air pollution causes asthma, respiratory diseases, lung cancer, heart disease, and stroke – affecting people of all ages.

With our air quality monitoring sensors that measure a wide range of gasses and particulates, communities can track air quality at the block level. Combined with Fybr's hyper-local weather data, city officials can track pollutants to their source to eliminate big polluters, while citizens can monitor air quality in real-time to make data-backed decisions about their daily activities.

From picking the cleanest bike route to avoiding outside activities when pollution is particularly bad, information can lead to a better, more informed, and healthier life.

Features

Plug-and-Play modular design allows gas sensors to be quicky customized to meet your specific gas-sensing needs – without the need to develop new devices.

Dynamic calibration automatically and continually adjusts for enviromental differences to ensure maximum accuracy.

Compact design allows for flexibility in a wide range of locations.

Long-lasting design ensures many years of maintenance-free performace.

Integrated FybrLynk™ enables all network protocol and radio communication, while allowing each device to operate autonomously and independently of the network.

THE FYBR PLATFORM
WEATHER MONITORING

Hyper-local weather monitoring is not only useful for more accurately informing communities of highly precise weather dat, but it is also a critical component to successfully managing a number of Smart City inititatives – giving it a multipurposed value.

- Transportation improves by avoiding flooded roads or high-pollution areas.
- Water Management improves when rain data is combined with sewage flow measures.
- Lighting management improves when storm and other adverse condition's data are integrated into the management system external conditions.

Features

Temperature, humidity, pressure.
A combined instrument mounted inside three double louvered, naturally aspirated radiation shields with no moving parts. The results are high performance across each measurement over long periods of time.

Wind.
Wind speed and direction measurements are provided via an ultrasonic sensor and the addition of an electronic compass provides apparent wind measurements. Average speed and direction together with WMO averages and gust data is also provided. Add GPS (optional) to provide true wind and other features.

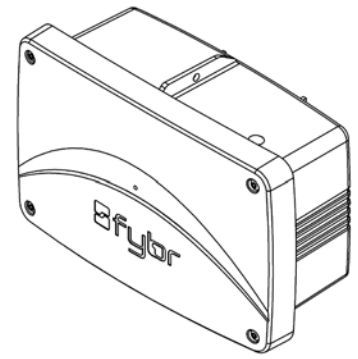
Precipitation.
An integrated optical rain gauge that automatically senses water hitting its outside surface and provides measurements based on the size and number of drops. Algorithms interpret this data and simulate the output of a tipping bucket rain gauge in a serial format. The optical rain gauge has no moving parts associated with tipping bucket gauges.

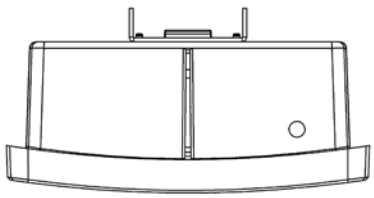
THE FYBR PLATFORM
FYBR GATEWAY

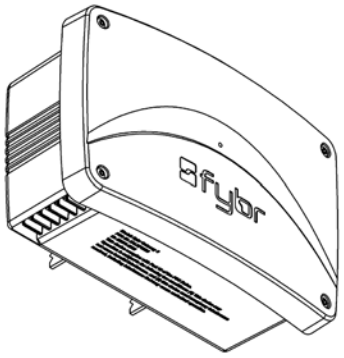
Rugged, reliable communications
for **real-world** environments.

The Fybr Gateway is a compact, microprocessor-controlled device that creates a bridge between a wide range of edge devices and the Fybr Engine. Data from Fybr-enabled edge devices travel through our gateways to the Internet, where it is processed and delivered as useful insights to users – from drivers to managers to technicians. Gateways use a proprietary 900 MHz radio protocol for two-way data exchange with sensors, while internet connections are handled by a choice of cellular modem, wifi, or ethernet.

Fybr Gateways offer multiple power options, all with battery backup: 120/240 volt line power, external solar panel or power over ethernet, and internal USB/expansion ports for additional modules. Additionally, all Fybr Gateways feature state-of-the-art 360° coverage, built-in fault detection, and a compact form factor that is aesthetically pleasing in a wide range of environments.







Features

Flexible power options to accommodate virtually any installation location. Line power, POE or externally mounted solar panels – all with battery backup of up to 6 days.

Dual radio allows secure communication for proprietary smart city and infrastructure devices, while simultaneously supporting LoRaWAN devices for non-critical city functions.

Auxiliary battery power provided by an 11.1-volt battery pack keeps communications up and running reliably and without power interruptions.

Internal expansion ports allow for the addition of new technology and functionality over time, without installation of new devices.

Battery fault detection ensures sensor data is rerouted to alternate devices when necessary, and alerts technicians of service needs.

Remote firmware upgrades executed with wirelessly delivered data patches optimize speed and minimize use of battery power.

Failsafe data relays with message confirmation and automatic switchover to alternate gateways when needed.

Compatible hardware pairs seamlessly with Fybr's end-to-end platform and can also be integrated with other systems/components.

Rugged industrial design from the inside out with technology and housing designed for performance in extreme conditions.

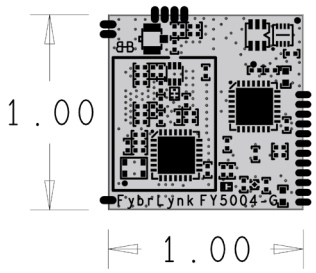
THE FYBR PLATFORM
FYBRLYNK

FybrLynk™ is an intelligent, flexible interface able to connect any low data rate edge device to the Fybr Platform. Secure, surface-mounted design facilitates easy installation within existing devices or incorporation into a device's manufacturing process.

Not much larger than a postage stamp (1" x 1" x 0.125"), FybrLynk packs robust features within its compact size. Network communication is handled by an onboard radio that uses LoRa modulation and the Fybr Radio protocol to make integration with the Fybr Platform simple. FybrLynk also accepts a variety of antennas to accommodate your range of communication and space limitations.

FybrLynk is much more than a "radio chip." It contains a sophisticated microprocessor that encrypts communications and can be programmed through the Fybr Engine to trigger events at the device level, either remotely or via onboard automated processes. This programming capability reduces the amount of information transferred, saving both time and battery power.

FybrLynk shortens prototype development from months to days and enables rapid deployment of a variety of IoT solutions including Smart Cities, Smart Utilities, Precision Agriculture, Smart Water Management (used for predictive flood models), Precision Asset Tracking, and Industrial IoT.



Features

Built in radio uses LoRa™ modulation and Fybr protocol for communications.

Enhanced security protects each individual device with NIST-approved algorithms, end-to-end encryption, and unique keys.

Adaptable data transfer comprised of four open-edge pad pins enables data input/output via high-speed communication, analog sensing, or discrete monitoring.

Remote upgrades save time and power, wirelessly delivering data patches to firmware.

Flexible power Interface with identical input and output voltage accepts 3-5VDC without any configuration.

Integrated microprocessor enables all network protocol and radio communications.

Compact size makes it easy to fit FybrLynk inside or outside most existing edge devices.

Automated insertion is a seamless process within tape-and-reel manufacturing lines.

Flexible antenna options enable configuration for size constraints or longer range using a standard U.FL connector.

Surface mounting without mechanical fasteners is easy with FybrLynk's castellated SMT pads.

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